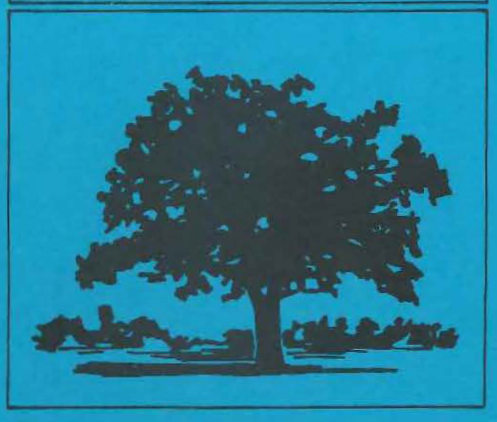

FOREST PEST CONDITIONS IN WISCONSIN

ANNUAL REPORT 1974

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FOREST PEST CONDITIONS IN WISCONSIN ANNUAL REPORT - 1974

Compiled and Edited by Donald W. Renlund
Supervisor, Forest Pest Control

DEPARTMENT OF NATURAL RESOURCES
Division of Resource Management
Bureau of Forestry

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PREFACE

Forest pest management personnel, department foresters and cooperators from other public agencies have contributed to the information compiled in this report.

A sincere thank you to all of them, plus the secretarial staff at Nevin Hatchery, Mrs. E. Hacker and her staff at Pyare Squre, and many others who contributed their time and talents toward getting this report to you.

Donald W. Renlund

Donald W. Renlund, Chief
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Department of Natural Resources
Forest Pest Control Personnel - January 1, 1976

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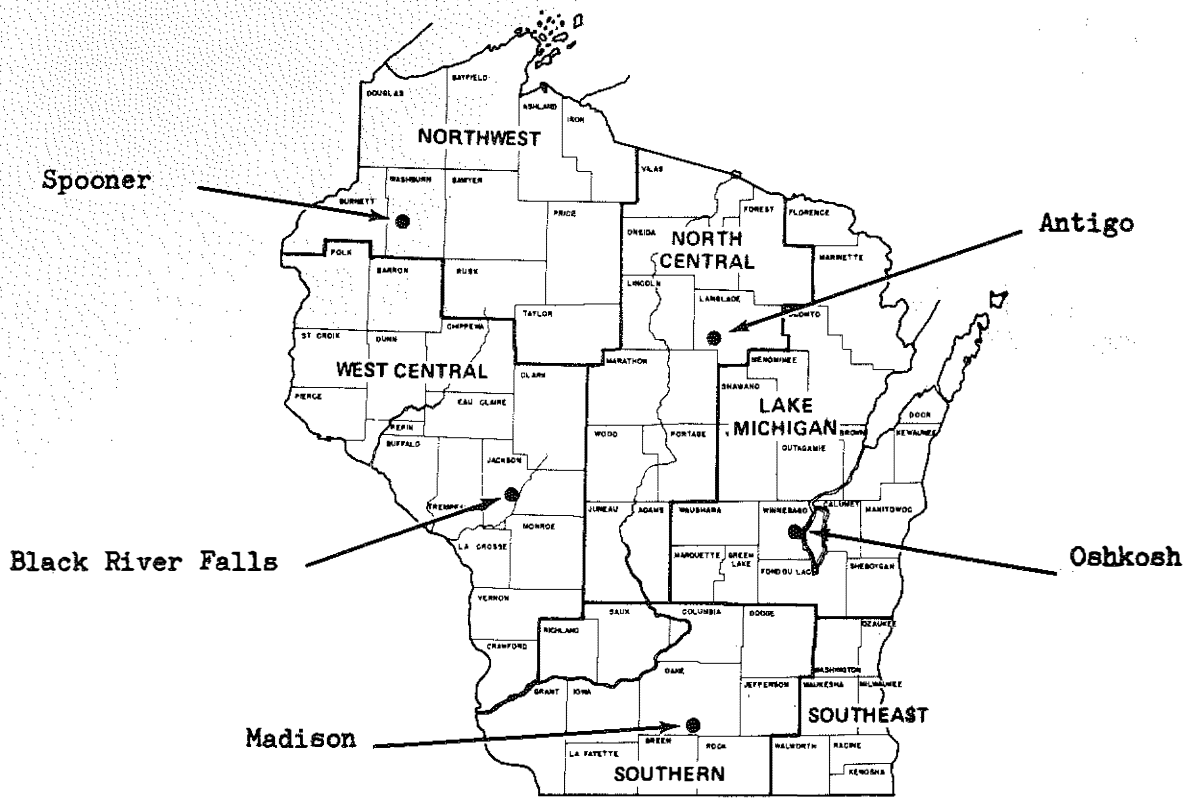


Highlights of Forest Pest Conditions - 1974

About 30,000 acres of jack pine were severely damaged by an ice storm on March 28-29 in Adams, Jackson, Juneau, Monroe, Portage and Wood counties. Operations were started to salvage an estimated 100,000 cords of timber.

An anticipated buildup of Ips beetles in ice-damaged jack pine in central Wisconsin counties did not materialize. Extremely dry conditions made broken tops unsuitable as brood wood. Occasionally standing butt portions of broken trees were heavily attacked.

White pine weevil activity appeared to be greater than in 1973 in the Northwest and North Central districts.

Christmas tree growers continued to score failures in attempting to control balsam gall midge with available insecticides.

Pine tortoise scale populations appeared to be increasing in the northeastern counties.

Late generation introduced pine sawfly larvae caused severe defoliation of many open-growing white pines across the northern counties. Five species of parasites emerged from cocoons collected in Waushara County.

Birch leaf miner infestations were heavy in north central counties.

European pine sawfly was found in Green County for the first time.

Adults of the pecan leaf casebearer have been reared from shoots of black walnut and identified.

Green-striped mapleworm caused defoliation of forest and ornamental red maples in northwest counties for the first time in many years.

Outbreak populations of spruce budworm continued in Oneida and Forest counties. Three new small outbreaks were observed in Bayfield and Iron counties.

Defoliation of jack pine by jack pine budworm was moderate to heavy on about 12,000 acres in parts of Bayfield and Douglas counties. Some top-kill occurred.

Oak leaf tier caused heavy defoliation of red oak and northern pin oak in northeastern counties. Top-kill and tree mortality occurred in Menominee County where trees had been heavily defoliated for 4 years.

Red pine shoot borers caused conspicuous damage to red pine in south central Wisconsin. Surveys indicated incidence of attack on shoots was greatest on windbreak trees and on the edges of plantations, and that the outbreak of these insects posed no threat to Wisconsin red pine.

No gypsy moths were caught in a statewide trapping program.

A gypsy moth parasite, Brachymeria intermedia (Nees), was released in Menominee County to determine, if in the absence of gypsy moth, it would become established in an alternate host.

The presence of Dutch elm disease has been confirmed in all except Bayfield and Iron counties.

Oak wilt appeared to increase in black oak and northern pin oak stands in sandy areas of central Wisconsin.

Red pine mortality, associated with shoestring root rot, continues in plantations and natural stands in west central Wisconsin. It is especially noticeable in plantations released from oak overstories during the mid-1960's.

Severe oak anthracnose on white and bur oaks in southern Wisconsin caused twig mortality.

Green ash leaf spot caused defoliation of seedlings at the F. G. Wilson State Forest Nursery at Boscobel. Benomyl and Zineb were applied in an effort to control the fungus.

Aspen shoot blight and leaf spot were common throughout northern Wisconsin aspen stands, especially in areas containing sod cover.

Needle droop of red pine in plantations was found throughout northwestern Wisconsin in late August and early September. In some plantations up to 5 years old more than 90% of the trees were affected.

White pine needle blight symptoms were scarce in the northern counties.

Investigation of the significance of red pine shoot blight continued in cooperation with the North Central Forest Experiment Station.

MAJOR FOREST INSECTS

COLEOPTERA

Bronze Birch Borer - *Agrilus anxius* Gory
Serious damage to individual trees was reported in Dodge, Waukesha, Dane, Walworth, and Adams counties. The insect was apparently responsible for mortality of 25% of the ornamental birch trees in Beaver Dam (Dodge County).

Cottonwood Leaf Beetle - *Chrysomella scripta* Fabricius
Larvae of this skeletonizer were common on quaking aspen in eastern Langlade and Oneida counties causing light to moderate defoliation.

Pine Root Collar Weevil - *Hylobius radicis* Buchanan
Tree mortality continued in areas of known infestations in Burnett, Washburn, Wood and Adams counties. Most of the damage is in Scotch pine and mixed Scotch and red pine plantings. One 10 year old Scotch pine Christmas tree plantation in Washburn County (Sec. 11, T39N, R11W) lost about 10% of the trees this year.

Pine Root Weevil - *Hylobius rhizophagus* Millers
Some new flagging was observed in known infestations in Burnett, Washburn, Wood, and Adams counties.

Pine Bark Beetles - *Ips* sp.
An expected population buildup in heavily ice-damaged jack pine in Adams, Juneau, and Wood counties did not materialize. Extreme dry conditions dried the broken tops sufficiently to prevent their use as brood material. A few of the standing butt portions were heavily attacked, but the population did not carry over to attack the standing healthy trees.

In the Northwest District, very dry mid-summer weather helped second generation beetles to invade living trees, primarily jack pine, in scattered locations throughout the district.

Pine Sawyer - *Monochamus* sp.
Severe twig mortality was caused by adult feeding on twigs on scattered individual balsam fir on a 25-acre site (Sec. 25, T39N, R11E) in Oneida County.

White Grubs - *Phyllophaga* sp.
Adult beetle defoliation was common among young aspen stands in the towns of Norwood and Rolling in southern Langlade County.

White Pine Weevil - *Pissodes strobi* (Peck)
Populations were above 1973 levels in the Northwest District. Up to 2% of the leaders were weeviled on roadside trees and in young jack pine stands.

In the North Central District, populations were light in plantation grown white pine and Norway spruce. Approximately 10% of the terminals were weeviled in a 20-acre jack pine planting on the Northern Highland State Forest (Sec. 35, T43N, R6E).

DIPTERA

Pitch Midge - *Cecidomyia reeksi* Vockeroth
Moderate to severe twig damage in natural jack pine stands was widely distributed in eastern Vilas County. Browning of jack pine twigs was evident near Conover on July 10.

Balsam Gall Midge - *Dasineura balsamicola* (Lintner)
In Washburn County, a light to moderate infestation continued on about 5 acres of balsam (Sec. 14, 15, T38N, R13W). There were also light infestations on 5 acres in Sec. 13, T41N, R12W and on 10 acres in Sec. 23, T41N, R10W.

Planted balsam fir were heavily infested in eastern Langlade County. An application of malathion following first gall formation was unsuccessful in controlling the midge.

HEMIPTERA

Elm Lacebug - *Corythucha ulmi* Osborn and Drake
Severe browning of elm foliage was observed in western Menominee, eastern Langlade, and Marathon counties.

Oak Lacebug - *Corythucha arcuata* (Say)
Severe browning of bur oak foliage was observed in northern Adams County.

HOMOPTERA

Saratoga Spittlebug - *Aphrophora saratogensis* (Fitch)
Populations remained low in the Northwest and North Central districts. A nymphal survey conducted on 400 acres of young red pine plantings in Vilas and Oneida counties indicated that there was no need for chemical control.

Pine Spittlebug - *Aphrophora parallela* (Say)
These spittlebugs were common throughout the Northwest District on jack and Scotch pine; however, no heavy infestations were found. The insects were abundant in the fourth and fifth instars on white pine in Outagamie County (Lake Michigan District).

Phenological Note: Adults beginning to emerge from spittle masses on jack pine at Spring Green on June 25.

Woolly Alder Aphid - *Prociphilus tessellatus* (Fitch)
This insect was extremely heavy on maples in Price County (Sec. 35, 36, T38N, R2E), where the woolly material and dripping sap was reported as an oil slick on a river. It was reportedly heavy on alder and maple in Solon Springs, Douglas County.

Pine Tortoise Scale - *Toumeyella numismaticum* (Pettit & McDaniel)
Populations continued to increase on jack pine in Marinette, Florence and Oconto counties. Crawlers were evident on July 3 and lady beetles were preying on the scales.

HYMENOPTERA

Introduced Pine Sawfly - *Diprion similis* (Hartig)
Late generation larvae were numerous enough to cause severe defoliation of many individual open-grown white pine trees in Burnett, Polk, Washburn, Marathon, Menominee, and Portage counties. In Menominee County the larger white pine stands received only light defoliation.

A small roadside planting of white pine in Wild Rose was very heavily defoliated. A collection of 200 cocoons yielded many adult sawflies and five species of parasites. Approximately 1000 adult *Monodontomerus dentipes* (Dalman) (*Hymenoptera:Torymidae*) emerged from the cocoons; one cocoon can produce as many as 15 adult parasites.

Birch Leaf Miner - *Fenusa pusilla* (Lepeletier)
Heavy defoliation occurred in scattered forest stands in Langlade, Lincoln, and Marathon counties, near Park Falls in Price County, and near Spooner in Washburn County. Birch leaves were turning brown by July 10.

Elm Leaf Miner - *Fenusa ulmi* Sundevall
Severe mining of elm leaves was observed in the towns of Norwood and Rolling in southern Langlade County and in eastern Marathon County. Severe defoliation was apparent on July 10.

Red-headed Pine Sawfly - *Neodiprion lecontei* (Fitch)
More observations of larvae and defoliation were reported in the west central counties than in recent years. Infestations were most common on open-grown jack pine reproduction. There were few reports of the insect from other parts of the state.

Red-pine sawfly - *Neodiprion nanulus nanulus* Schedl
Populations were low throughout the state. Egg mass surveys indicated a continuing low population on the site of the 1972 outbreak in Adams and Wood counties.

European Pine Sawfly - *Neodiprion sertifer* (Geoffroy)
Scattered heavy defoliation occurred in red and Scotch pine plantations in Walworth, Kenosha, Racine, and Grant counties. A new infestation was found near Brodhead (Sec. 1, T1N, R9E) in Green County in a Scotch pine planting. An egg survey in Green and Rock counties yielded no overwintering egg clusters.

Phenological Notes:
May 3 - Egg hatching in Walworth County.
May 7 - Eggs hatching on a Scotch pine near Brodhead (Green Co.).

For details on mortality and recommendations on biological control, see: Lyons, L.A., D.M. Benjamin, and D.W. Renlund. 1974. Preliminary studies of the European Pine Sawfly in Wisconsin. University of Wisconsin Forestry Research Note 187, 4p.

Larch Sawfly - *Pristophora erichsonii* (Hartig)
Aerial surveys indicated severe defoliation of scattered tamarack stands in Vilas, Oneida, Forest, and Langlade counties. Light to moderate defoliation was observed in Portage and Marathon counties. In the Northwest District, only an occasional tree showed light to moderate defoliation.

Mountain-ash Sawfly - *Pristophora geniculata* (Hartig)
Many ornamental trees in the Northwest (Washburn Co.) and North Central districts (Langlade Co.) were severely defoliated. Larvae were in late instars on July 10.

LEPIDOPTERA

Oak Webworm - *Archips fervidanus* Clemens
Several colonies were found on scrub oak in Bayfield County (Sec. 9 & 16, T46N, R9W). Colonies were also common on black oak on the Black River State Forest (Jackson Co.).

Pecan Leaf Casebearer - *Acrobasis juglandis* (LeBaron)
Observations in Buffalo, Trempealeau, LaCrosse, Monroe, Crawford, Grant and Dane counties confirmed that lepidopterous larvae were mining black walnut buds early in the spring, causing loss of many terminal shoots. The damage is easily mistaken for frost damage.

Adults have been reared and identified as *Acrobasis juglandis*. This or a closely related species also bores into expanding shoots in June causing severe deformity of the main stem.

The insect is apparently distributed over the entire range of black walnut in Wisconsin. Virtually all the young black walnut plantations examined in 1974 were severely deformed. A young plantation in Iowa County was found growing straight despite the presence of the insect. The spacing was 6'x 6' and the crowding effect probably overcame the effect of the shoot borer.

Green-striped Mapleworm - *Anisota rubicunda* (Fabricius)
Localized populations in parts of Burnett and Washburn counties caused some severe defoliation of forest and ornamental red maple for the first time in many years. Maples on 140 acres were defoliated in Burnett County, and on 110 acres in Washburn County. The most severe defoliation occurred in T39N, R13 & 14W. Larvae had pupated by August 16.

Large Aspen Tortrix - *Choristoneura conflictana* (Walker)
Populations were generally down from 1973 levels. Only light to moderate defoliation occurred in parts of Langlade and Menominee counties where there had been heavy defoliation during the previous year. Only light defoliation occurred in some aspen stands in northern Douglas and Bayfield counties. The only area of severe defoliation occurred in Forest County (Sec. 23, T37N, R14E).

Phenological Notes:

May 21 - Aspen leaves up to 1 inch long; 3rd instar larvae in curled and webbed leaves in Langlade County.
May 22 - Larvae mostly 2nd instar; buds unopened in some aspen clones; leaves up to 1" long in others (Menominee Co.).
June 20 - 80 percent of population in pupal stage in Langlade County.

Spruce Budworm - *Choristoneura fumiferana* (Clemens)
Outbreak populations continued in Oneida and Forest counties (Figure 1). Three new small outbreaks were observed in Bayfield and Iron counties.

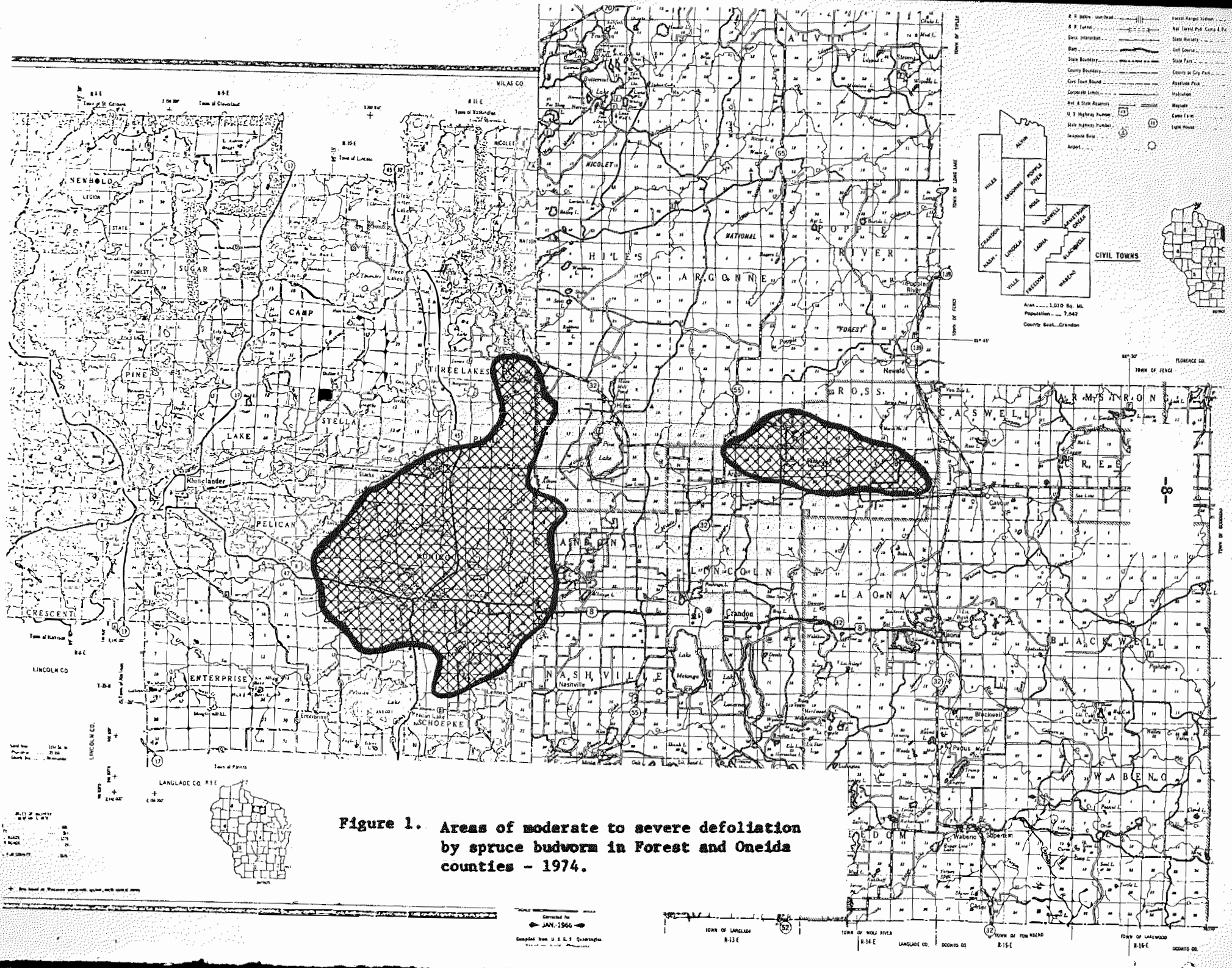


Figure 1. Areas of moderate to severe defoliation by spruce budworm in Forest and Oneida counties - 1974.

A small area was heavily defoliated in Bayfield County. This outbreak was predicted on the basis of high 1973 egg mass counts. Two areas of spruce-fir type in Iron County (Sec. 3, 4, and 25, T44N, R2E), totaling about 500 acres, were moderately to severely defoliated. Egg counts indicated a potential for heavy defoliation again in 1975.

The spruce budworm has been in outbreak in parts of Forest and Oneida counties since 1969. On the Monico Unit of the Consolidated Industrial Forest in Oneida County mostly balsam in low-lying areas or along the periphery of hardwood ridges is being affected. Several drainage systems contain streams which flow into the Pelican River or the Wolf River. Age of the affected balsam varies considerably but most is in the 45-55 year age-class.

The most severe infestations in Oneida County were in T35, 36N, R10E and T35, 36, 37, 38N, R11E. Defoliation was light (less than 20%) on 2,000 acres, moderate (21-40%) on 2,000 acres and heavy (more than 40%) on 7,500 acres. Light defoliation was too inconspicuous and erratic for mapping from the air (Figure 1).

Thirty plots were established in Oneida County to evaluate impact of the budworm on the spruce-fir type in 1973. In one area of heavy defoliation, covering 4 sections near Mud Lake Road (Sections 11, 12, 13 and 14, T36N, R11E), more than 50% of the defoliated trees were killed. Accelerated logging in such areas minimized the economic loss, but the fire hazard from slash and dead trees was high. Logging operations destroyed many of the 30 plots, but tree mortality in such defoliated areas was estimated at 30%. Tree mortality in the moderate defoliation class amounted to 7%, while in areas of light defoliation no mortality was apparent. No estimates of top-kill or growth loss were made but they appeared to be substantial in many stands. Egg mass counts in Oneida County showed a decrease from 2.38 egg masses per 15-inch branch in 1973 to .92 egg masses in 1974. A Tachinid parasite, Phryxe sp., was extremely abundant in infested stands and is presumed to have destroyed a large number of budworm pupae.

An outbreak on the Argonne Unit of the Consolidated Industrial Forest in Forest County involved mostly white spruce plantations, but some small, scattered mature balsam stands were also infested. The area covered parts of Sections 22, 23, 24, 25, 26 and 28, T37N, R14E (Figure 1). Light defoliation covered 400 acres; moderate, 1,200 acres; and heavy 200 acres. The infested area increased by about 900 acres over that of the previous year. No top-kill or tree mortality were apparent in the Argonne Unit in 1974. Egg mass counts dropped from 2.23 per 15"-branch in 1973 to 1.70 in 1974.

Approximately 2,500 acres of balsam fir were defoliated to varying degrees on National Forest and private lands east of Argonne in Forest County. The defoliation was first noticeable from the air this year.

The long-range potential for spruce budworm outbreaks in northeast Wisconsin is apparently increasing. There is a large volume of spruce and fir included in other types. Of particular importance is the large acreage of aspen type that is converting to balsam fir.

Budworm larvae were observed on ornamental spruce in Dane County and, for the first time according to available records, in a spruce plantation in Jackson County and on ornamental blue spruce in Eau Claire County.

Phenological Notes:

May 5 - Severe mining of balsam needles by 2nd and 3rd instar budworm larvae; some head capsules present in frass outside old needles; buds are still dormant. (Oneida Co.)

May 15 - First overwintered larvae observed in Washburn County.

May 17 - Larvae mining in unopened buds of white spruce (Forest Co.)

May 20 - Larvae continue to mine needles with some migration to open buds. Balsam buds expanded to ¼". (Oneida Co.)

May 23 - Larvae in 2nd instar on spruce and balsam in Oneida County. Larvae in expanding buds, some in needles, some in hibernaculae on balsam and white spruce.

May 31 - 36% of buds infested in areas of previously light defoliation; 63% infested in moderate defoliation and 91% infested in areas of heavy defoliation. (Oneida Co.)

June 5 - New growth on white spruce varies from dormant buds to 1½". Larvae primarily under bud caps. (Forest Co.)

June 14 - Mostly 5th instar on balsam and 3rd to 5th instar on white spruce in Forest and Oneida counties.

June 18 - Larvae scarce and poorly developed in balsam areas heavily defoliated the past three years. Little current growth in these areas, and tree mortality increasing. About 10% of the larvae appear to be parasitized. (Oneida Co.)

June 28 - Pupation varies from 40% in the lower crowns to 75% in the upper crowns. (Oneida Co.)

July 10 - 95% pupated in Oneida County.

July 16 - Many adult parasites observed in areas of heavy defoliation. Egg laying underway. (Oneida Co.)

July 23 - No budworm moths observed; most eggs have hatched and 1st instar budworm larvae abundant. (Oneida Co.)

Jack Pine Budworm - *Choristoneura pinus pinus* Freeman

Early larval counts were low in Polk, Burnett and Washburn counties. Moderately high counts in Douglas and Bayfield counties combined with high larval survival caused some heavy defoliation. An area of about 12,000 acres of jack pine in parts of Douglas County (T44N, R10 and 11W; T45N, R10 and 11W; T46N, R10W) and Bayfield County (T45N, R9W; T46N, R9W) suffered moderate to heavy defoliation. Some top-kill occurred, especially on suppressed trees. Pupal and egg counts indicate a potential high 1975 population covering 50,000 acres of jack pine. Egg parasitism averaged less than 10%. Pupal parasitism reached 40% in a few plots. Populations are building up in younger stands where damaged trees are not salvageable.

Aerial photographs were taken of an area in Douglas County where jack pine budworm outbreaks have occurred regularly and frequently in the past (Figure 2). The objective was to determine the rate and direction of spread from current infestation centers.

The photographs were taken from the Department's DC-3 on July 13, 1974. The area was photographed with Kodak Aero Ektachrome, Type 2448 and Kodak Aero Ektachrome Infrared, Type 2443, 9x9" format at a scale of 1:7,920 (1"=600').

In Vilas and Oneida counties, late larval surveys showed an extremely light population in spite of very heavy staminate flower production.

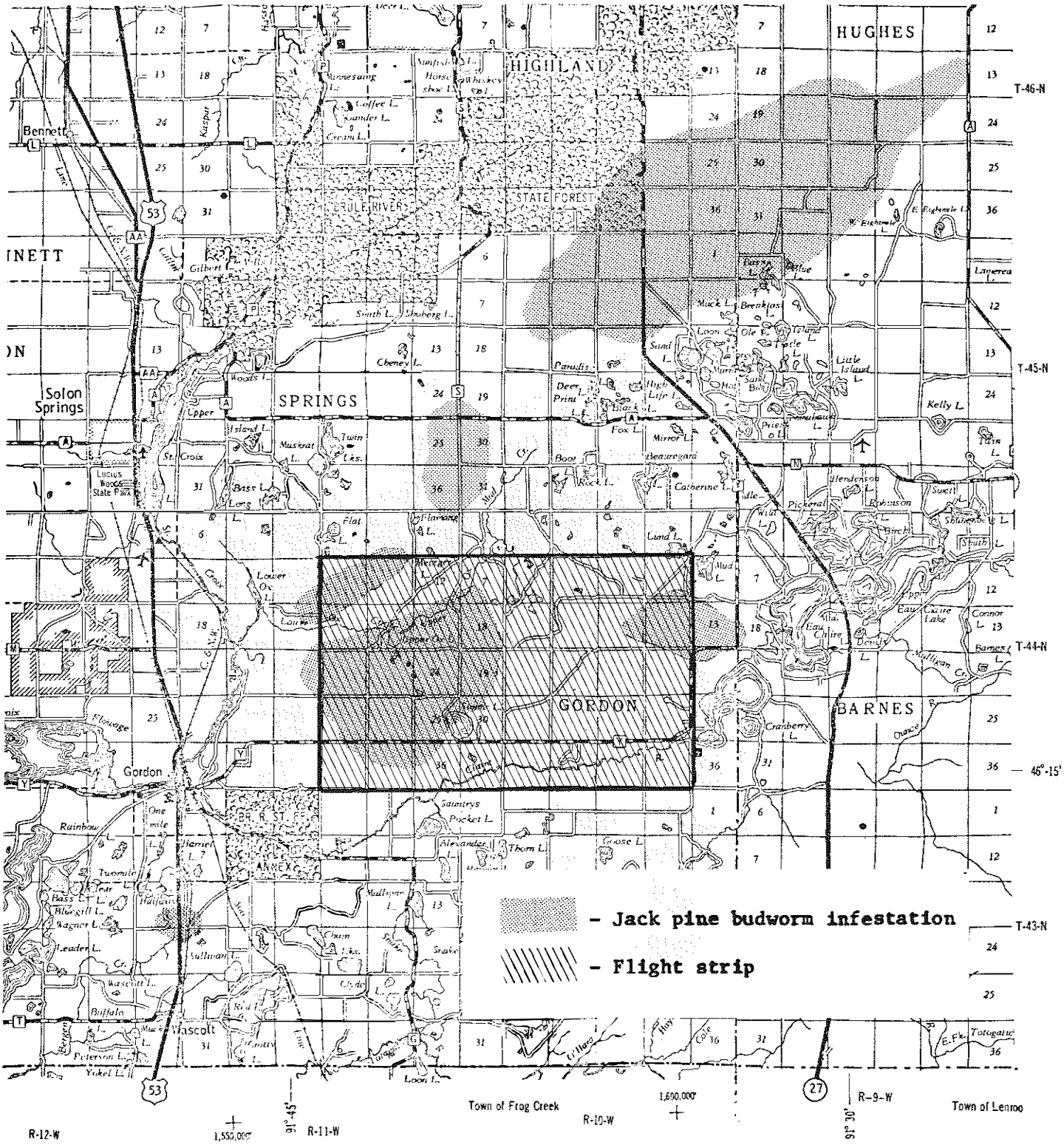


Figure 2. Jack pine budworm aerial photography area - 1974.

Phenological Notes:

May 22 - First overwintered larvae found in Douglas County (T44N, R11W). PJ leaders 3-5" long, pollen cones green and hard.
May 29 - Larvae out of hibernation in all northwest counties and feeding. Pollen starting to ripen. PJ leaders 4-12") long.
June 3 - Larvae still small, 2nd instar, in Douglas County. Pollen ripe and plentiful. PJ leaders 4-12" long.
June 12 - Larvae still 2nd instar in Bayfield County. Pollen all gone. PJ leaders 4-12" long.
June 13 - Some 3rd instar larvae in central Douglas County.
June 18 - Apanteles becoming quite numerous in Polk and Burnett counties.
June 26 - Most larvae 4th instar in Douglas and Bayfield counties.
July 1 - Most larvae in 6th instar; some pupae.
July 9 - About 50% pupated in Vilas and Oneida counties, 85% in Douglas County, 99% in Burnett and Polk counties.
July 11 - About 98% pupated in Douglas and Bayfield counties. Some adults present.
July 18 - Majority in adult stage in all counties.
July 29 - Eggs starting to hatch in Douglas County. Moth flight about over.

Oak Leaf Tier - *Croesia semipurpurana* (Kearfott)

Populations generally increased in the North Central and Lake Michigan districts. Heavy defoliation of red oak and northern pin oak occurred in Florence, Marinette, Menominee, Langlade, Oneida and Portage counties. Defoliation in Marinette and Florence counties was surveyed from the air on June 21 (Figure 3).

In Menominee County, top-kill and tree mortality is confined to about 700 acres of red oak northwest of LaBelle Tower (Sec. 19, 29, 30, T30N, R16E); an area that has been heavily defoliated for the past four years. Data were taken from three 1/5-acre impact plots established in the area in 1973 (Table 1). It is evident that the suppressed and intermediate crown classes are taking heavy mortality, while only a few dominant trees (5 out of 54) are being lost. This can be interpreted as being a beneficial thinning process.

Table 1. Red Oak Mortality in Menominee County Following Defoliation by *Croesia semipurpurana* (Kearfott)

		Dead Trees								
		1973			1974			Accumulative 1973-74		
Crown Class	Trees Examined	No.		%	No.		%	No.		%
Dominant	54	3	6*	(2.1)**	2	3*	(1.5)**	5	9*	(3.6)**
Intermediate	48	12	25	(8.6)	5	10	(3.5)	17	35	(12.1)
Suppressed	38	29	76	(20.7)	4	11	(2.9)	33	87	(23.6)
	140	44		(31.4)	11		(8.3)	55		(39.3)

* % annual mortality within crown class
** % annual mortality of total trees examined

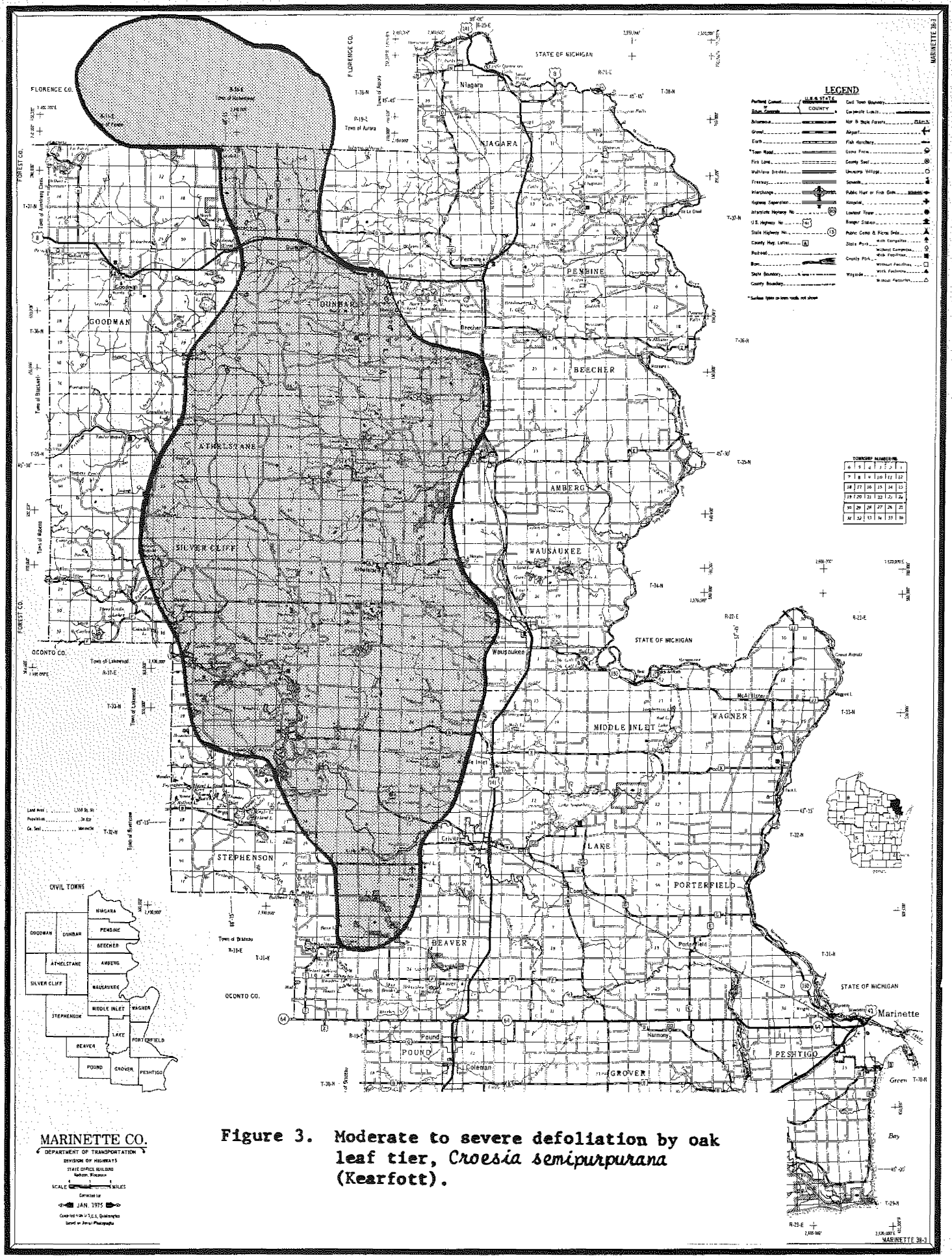


Figure 3. Moderate to severe defoliation by oak leaf tier, *Croesia semipurpurana* (Kearfott).

Phenological Notes:

May 7 - Larvae mining in tight buds; some have spun a light web and are located at the base of unopened buds. Approximately 70% of buds examined were being mined by 1st instar larvae.

May 15 - Red oak buds vary from dormant to ¼" expanded, northern pin oak buds largely dormant, larvae actively mining in buds.

May 21 - Red oak buds dormant and up to ½" expanded, larvae webbing newly opened leaves.

May 22 - 2nd instar larvae mining buds of red and northern pin oak in Menominee County. Northern pin oak mostly dormant, red oak buds swelling.

June 19 - Mostly pupated in Menominee County. Severe defoliation of red and northern pin oak in localized areas.

July 10 - Adult stage predominant in Bayfield, Menominee, Shawano and Oconto counties.

Pine Tussock Moth - *Dasychira plagiata* Walker

Populations continued at very low levels. Only a few egg masses were found in Douglas and Bayfield counties.

Larvae were numerous on several ornamental blue spruce in Oconto County on June 26.

Red Pine Shoot Borers

In late June, browning of shoot tips caused by a boring insect on red pine started showing up throughout the state. The heaviest concentrations of attack were in Marathon and Waushara counties on pole-size trees. Heavy concentrations of attacked shoots were also found on windbreaks in Sauk and Iowa counties.

A complex of at least two and possibly three species of Lepidoptera was responsible. The classic symptoms of Zimmerman pine moth (*Dioryctria zimmermanii* were found in many plantations but at concentrations too low to have caused the outbreak. An unidentified species of Lepidoptera was collected at the Pardeeville School Forest in Columbia County. The majority of the damage could have been caused by this species which resembles the tip moth *Exoteleia nepheos*; however, its damage is somewhat different than described in the literature. Some damage was found which resembled that of neither the Zimmerman pine moth nor *Exoteleia*. It might be caused by an undescribed species of *Dioryctria* previously reported in Canada.

A survey was conducted in October, 1974 to evaluate the potential damage to red pine timber values. Windbreaks and plantations were examined in Grant, Richland, Iowa, Sauk, Columbia, Marquette and Waushara counties.

The intensity of attack was heaviest in windbreaks and edges of plantations. Fewer than 2% of the terminals within the interiors of well-stocked plantations were attacked. It was concluded that outbreaks of these insects do not threaten to deform a significant portion of the red pine in Wisconsin.

Pine Needle Miner - *Exoteleia pinifoliella* (Chambers)

Yellowing of the needles on branch tips is common in Washburn County (T41N, R13W; T42N, R13W) and in Douglas County (T43N, R13W). On some young trees up to 30% of the needles have been mined.

Variable Oak Leaf Caterpillar - *Heterocampa manteo* (Doubleday)
Spots of noticeable defoliation occurred in parts of Burnett and Washburn counties and infestations were reported from Jackson County. Heavy defoliation of red oak, white birch, elm, and basswood occurred in scattered patches over a two square mile area in Langlade County (Sec. 4 & 9, T32N, R11E).

An area of light defoliation was reported in the Harrison Hills area of Lincoln County.

Phenological Notes.
September 11 - Larvae dropping to ground in Jackson County to pupate.
September 20 - A few larvae remained on foliage im Langlade and Lincoln counties.

Gypsy Moth - *Porthetria dispar* (Linnaeus)
The statewide trapping program in cooperation with USDA-Animal Plant Health Inspection Service (APHIS) and Wisconsin Department of Agriculture produced no male gypsy moths (Figure 4). The gypsy moth parasite, *Brachymeria intermedia* (Nees), was released in Menominee County (Appendix A).

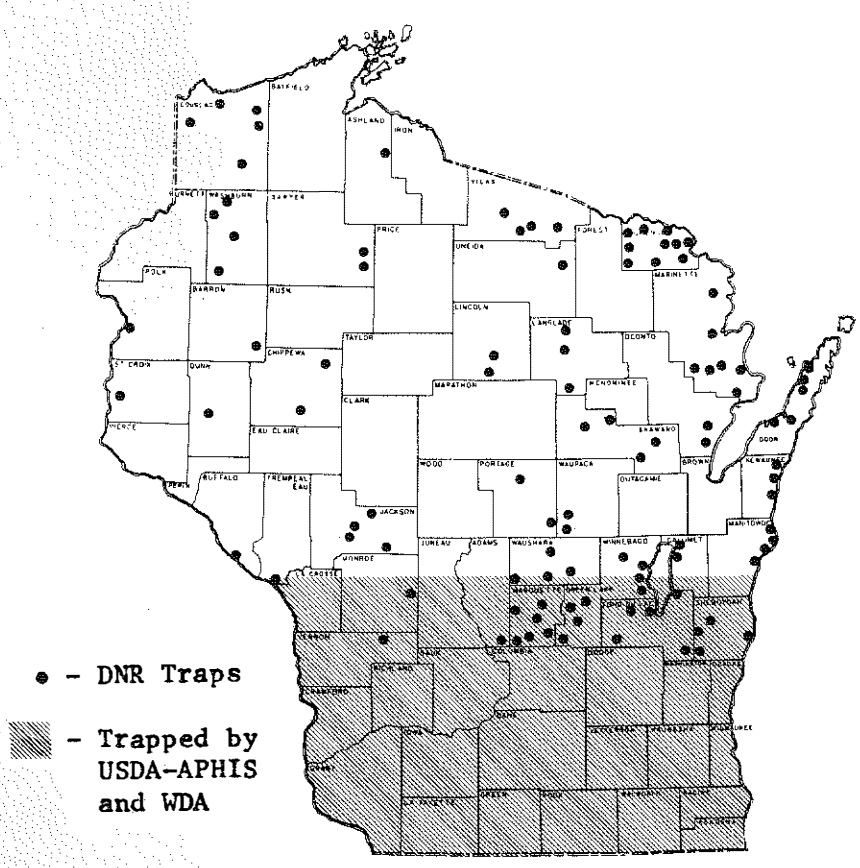


Figure 4. Distribution of Gypsy Moth traps in Wisconsin - 1974.

Eastern Tent Caterpillar - *Malacosoma americanum* (Fabricius)
Populations were generally low with a few tents on cherry and juneberry in Burnett and Washburn counties. Open-grown black cherry were heavily defoliated at several locations in Langlade County (Sec. 20, T30N, R12E). Numbers of tents were at their usual high densities in Rock County; as many as 20 tents were counted on some large open-grown black cherry trees.

Phenological Notes:
June 19 - Most larvae pupated in Langlade and Menominee counties.

Forest Tent Caterpillar - *Malacosoma disstria* Hubner
Larvae were reported near Lake Nebagamon and near Pattison State Park in Douglas County. Egg surveys in these areas produced no egg masses.

ORTHOPTERA

Walkingstick - *Diapheromera femorata* (Say)
Moderate numbers of walkingsticks were found in Sec. 29, 30, 31 and 32, T43N, R13W in Douglas County. Scrub oak and hazel were lightly defoliated.

MAJOR FOREST DISEASES

WILTS AND DIEBACKS

Dutch Elm Disease - *Ceratocystis ulmi* (Buisman) Moreau

Dutch elm disease continues to be the major forest disease problem in Wisconsin. The disease is present in 70 of Wisconsin's 72 counties. Bayfield and Iron counties are the only counties where the disease has not been confirmed (Figure 5).

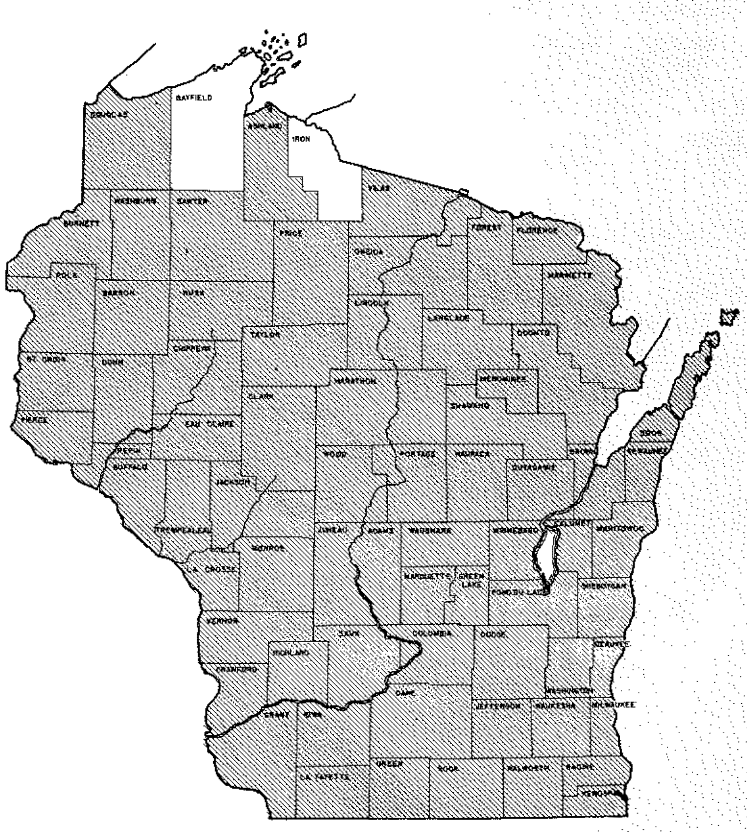


Figure 5. Known distribution of Dutch elm disease in Wisconsin - 1974.

Dutch elm disease which has been primarily an urban problem in the past 18 years is now killing millions of board feet of high quality American elm in northern Wisconsin. An elm utilization seminar at the Northern Hardwood and Pine Association meeting in Green Bay in March has helped find markets for woodland and urban elms.

Recommendations for storage, transport, utilization and disposal of infected and/or infested trees were considered jointly by the agencies having responsibilities in this area. They include the Wisconsin Department of Agriculture, Department of Natural Resources, League of Wisconsin Municipalities and the Departments of Entomology, Plant Pathology and Forestry of the University of Wisconsin - Madison. Following are the recommendations agreed upon:

1. Movement of elm logs with bark intact is permissible to any destination within the State of Wisconsin from the period beginning August 1 through April 30 of each year. This stipulation is subject to local government restrictions.

2. Elm logs, brush, and stumps chipped or shredded constitute no hazard to the spread of Dutch elm disease.
3. Diseased elm logs sawed into lumber would be safe for local use or shipment without possibility of spreading Dutch elm disease.
4. Completely debarked logs would be safe at any time for shipment without threat of spreading Dutch elm disease.
5. Stockpiling of elm logs with bark intact during the months of May, June, and July would not be tolerated.

Dutch elm disease was confirmed on the Flambeau River State Forest in June. An aerial survey for the disease was conducted on July 16, 1974 from a Cessna Skylane at an altitude of 1,000 feet. Infected areas were sketch mapped on a USGS Quadrangle map by the State Forest Manager and a DNR photointerpreter. The survey maps were then used by the State Forest Manager to establish timber sales in areas where dead and dying elms were prevalent.

Oak Wilt - *Ceratocystis fagacearum* (Bretz) Hunt

Oak wilt appeared to increase in black oak and northern pin oak stands in sandy areas of central Wisconsin. Many new infection centers were noted and existing pockets continued to enlarge. Oak wilt is one of the major problems in southern Wisconsin urban woodlots where trees have been wounded in the process of building homes.

There was no change in the statewide distribution of oak wilt in 1974 (Figure 6).

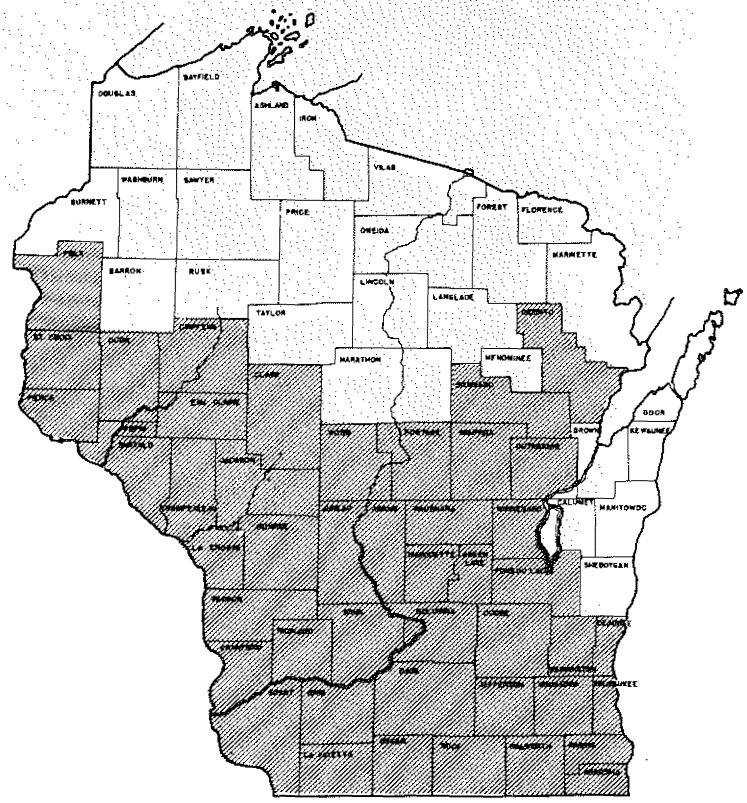


Figure 6. Known distribution of oak wilt in Wisconsin - 1974

Butternut Dieback - Unknown
Butternut mortality and dieback continues to be a problem in southwestern Wisconsin. Studies are in progress at the University of Wisconsin on the fungi associated with the dieback.

ROOT ROTS

Shoestring Root Rot - *Armillaria mellea* (Vahl ex Fr.) Kummer
Mortality continues in red pine plantations and natural stands in west central Wisconsin. It is especially noticeable in plantations released from oak overstories during the mid-1960's. The number of infected trees appear to be increasing in a pole-size red pine plantation in the Eau Claire County Forest (Sec. 7, T26N, R6W), where oak was removed in 1961 and a commercial pulp thinning was completed in 1972. A more intensive survey of the plantation is planned for 1975. However, less than 0.5% new mortality was found in previously infected red pine plantations in Bayfield, Burnett, Douglas and Washburn counties where the overstory was cut or killed with herbicides.

FOLIAGE DISEASES

Brown Spot Needle Blight - *Lecanosticta acicola*
Brown spot has been reported in 18 counties since 1966 (Figure 7) and has damaged approximately 500,000 Scotch pine Christmas trees. However, fungicide spray programs from 1970-1973 have enabled growers to market previously infected trees and have prevented new infections on younger trees. In Jackson and Monroe counties there was increased infection in untreated plantations in 1973 and symptoms were evident in the spring of 1974. These plantations were sprayed twice in the summer of 1974 with Daconil and satisfactory control obtained.

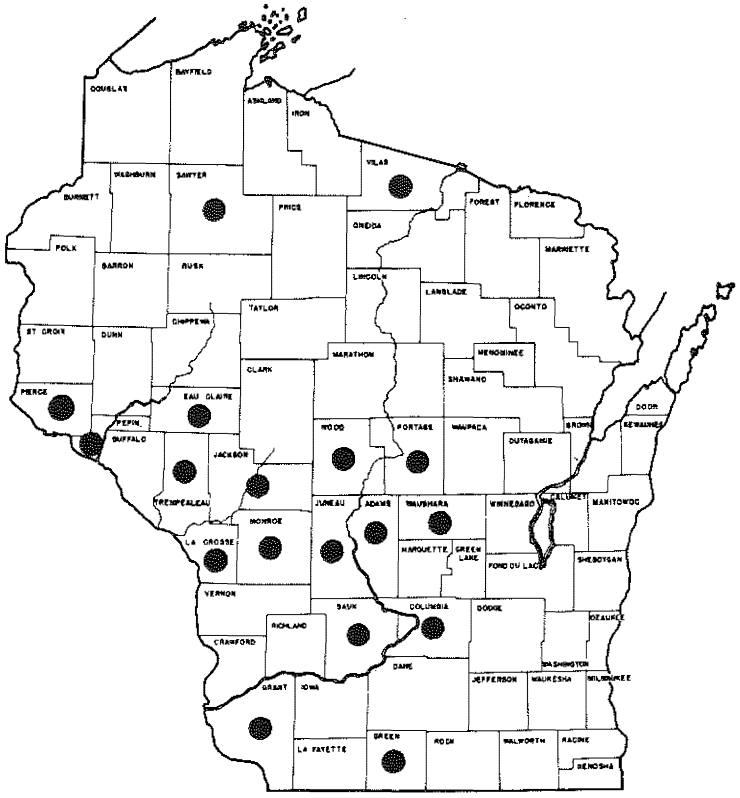


Figure 7. Known county distribution of brown spot disease of Scotch pine in Wisconsin - 1974.

Oak Anthracnose - *Gnomonia veneta* (Sacc. & Speg.) Kleb.
Anthracnose was unusually severe on white and bur oaks in southern Wisconsin. Some bur oaks were so severely infected that twigs were killed.

Green Ash Leaf Spot - *Mycosphaerella effigurata* (Schw.) House
A leaf spot caused by the fungus *Mycosphaerella effigurata* was defoliating green ash seedlings at the F. G. Wilson State Forest Nursery at Boscobel (Figure 8). In an attempt to control the disease, the nursery superintendent treated some rows with Benlate 50W (1 lb. actual benomyl/A.) and others with Zineb 80W (1 lb. actual Zineb/A) on June 24, 1974.

The Benlate application was successful in preventing new infections and Benlate treated trees were taller. When the trees were measured on September 5, 1974 seedlings treated with Benlate averaged 6.0" tall, while those sprayed with Zineb averaged 3.2" in height (Figure 9). The influence of the fungicides, if any, on the size difference is unknown. More complete trials with appropriate check plots are planned for 1975.

Aspen Shoot Blight and Leaf Spot - *Venturia* spp.
Shoot blight and leaf spot were common throughout many aspen stands in northern Wisconsin. Early leaf discoloration and leaf fall were noted. Shoot blight appears to be the major cause of forking in young aspen stands, especially in low areas. In Langlade County an examination of many K-G blade cut areas showed some stands with 30% of the new sprouts infected. An evaluation of sprouting success (stems/acre) was made of all 1974 winter cut K-G areas in Langlade County in late September. Success varied from 9,000 to 30,000 stems per acre depending on the site. Those areas containing sod ground cover were least successful in sprouting and also had the largest number of shoot blight infections. Some Cytospora canker was also noted in these areas.

Lophodermium Needle Cast - *Lophodermium pinastri* (Schrad) Chev.
Lophodermium needle cast continued to damage about 1,000 acres of Scotch pine Christmas trees in central Wisconsin. The majority of infected trees occurred in Waushara and Portage counties with Spanish and French varieties of Scotch pine most severely affected. Approximately 400 acres were aerially sprayed twice with maneb. Another 250 acres were sprayed with mistblowers. Maneb sprays in 1973 greatly reduced infection in a Jackson County plantation but winter injury was severe on Spanish variety Scotch pine in April of 1974.

Numerous requests for assistance with identification of foliage problems on Christmas trees came from growers. A leaflet prepared in 1973, showing them how to distinguish between winter injury, brown spot and Lophodermium needle cast, was widely distributed to help growers diagnose injury to foliage (Figure 10).

Lophodermium pinastri was collected from foliage of a 33-year-old red pine in a plantation at the Trout Lake Forestry Headquarters of the Northern Highland State Forest. There was an unusual amount of needle browning and defoliation in the lower 1/3 of the tree crowns during August. The defoliation was severe, but a fungicide treatment was not necessary.

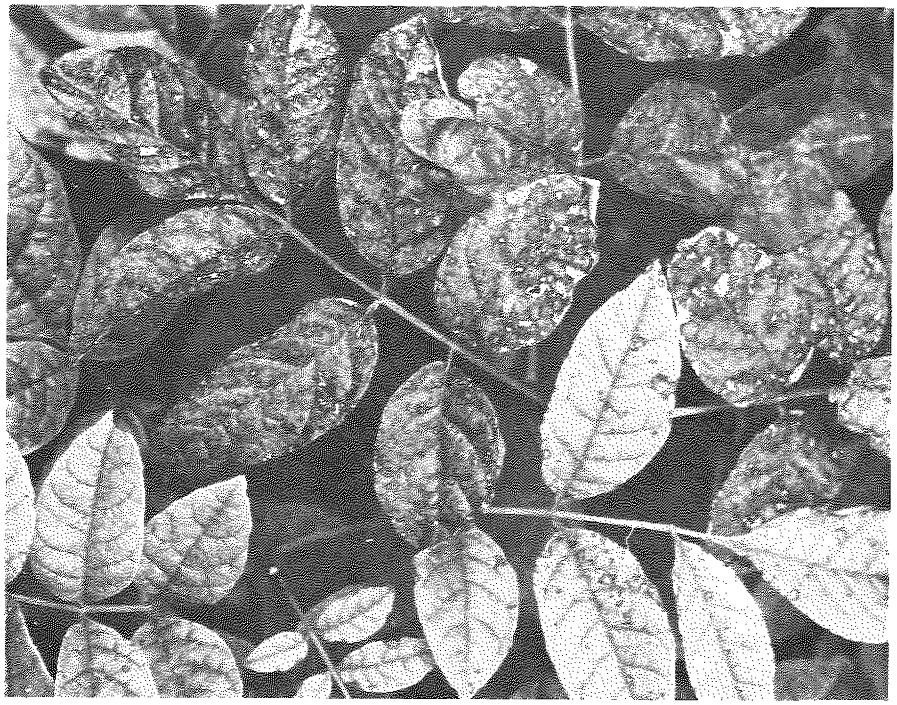


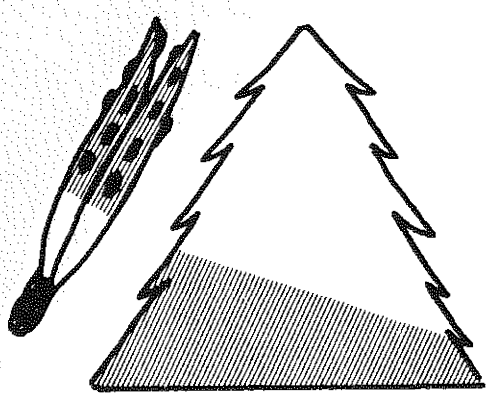
Figure 8. Leaf spot (*Mycosphaerella effigurata*) on green ash seedlings at F. G. Wilson State Forest Nursery, Boscobel, Wisconsin.

Figure 9. Green ash seedlings sprayed with Benlate averaged 6.0" in height (foreground). Those treated with Zineb averaged 3.2 inches. F. G. Wilson State Forest Nursery, Boscobel.

MAJOR NEEDLE DISEASES OF SCOTCH PINE IN WISCONSIN

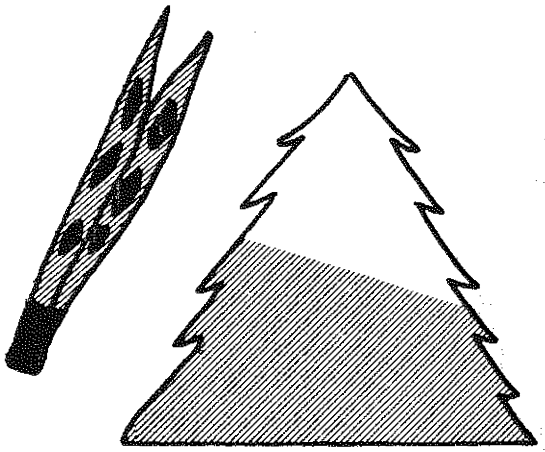
by

Allen J. Prey, Forest Pathologist
Department of Natural Resources
Madison, Wisconsin 53711



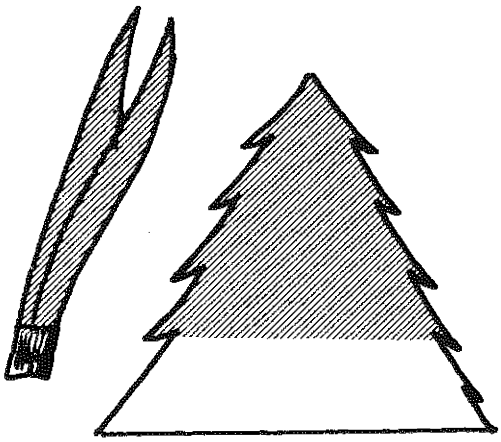
BROWN SPOT - Lecanosticta acicola

SYMPTOMS - Needles brown in lower crown & north sides during August.
CAUSE - Fungus spores discharged in summer infect new needles.
CONTROL - June 15 and August 15 sprays of Bordeaux mixture or chlorothalonil. *



LOPHODERMIUM - Lophodermium pinastri

SYMPTOMS - Needles usually brown in lower crown, often below snowline in April.
CAUSE - Fungus spores discharged from August-October infect needles which turn brown in the spring.
CONTROL - July 25, August 15 & September 10 sprays of chlorothalonil or maneb. *



WINTER INJURY

SYMPTOMS - Needles brown above snowline or south side in March or April.
CAUSE - Sunlight or wind caused moisture loss.
CONTROL - No chemical control available. Wait to see if affected portion fills in. Avoid planting susceptible varieties such as Spanish Scotch Pine.

*

Chlorothalonil (Bravo W-75, Daconil 2787).
Maneb (Manzate 200, Manzate D, Dithane M-22).

Figure 10. Comparison of symptoms and control for brown spot, *Lophodermium*, and winter injury or Scotch pine in Wisconsin.

Spruce Needle Cast - *Rhizosphaera kalkhoffii* Bub.
Rhizosphaera kalkhoffii continued to defoliate Colorado blue spruce Christmas tree plantations in Wisconsin [1/]. Forest pathologists at the North Central Forest Experiment Station, USDA, Forest Service, St. Paul, Minnesota continued to evaluate *R. kalhoffii* life cycle and control plots in Jackson and Waushara counties in 1974. Similar studies were also conducted near Hastings, Minnesota. Results of 1972 and 1973 fungicide applications indicated the most effective fungicides were chlorothalonil benomyl, chlorothalonil or Bordeaux mixture when applied the first week of June and first week in July. Benomyl and chlorothalonil are not registered for Rhizosphaera control but Bordeaux mixture is registered for needle cast on spruce.

Air Pollution
The Forest Pest Control Section cooperated with the DNR Air Pollution Control Section in surveying air pollution damage to vegetation in Wisconsin. Surveys in 1973 and 1974 revealed that pollution injury to vegetation occurred in the Village of Brokaw in Marathon County in both years. A survey on June 7, 1974 indicated the following:

Vegetation damage was confined to an area approximately 100 feet wide by 700 feet long, extending northeast from the mill stack of the Wausau Paper Co. Vegetation shielded by buildings was not as severely affected.

Vegetation damage:

Severe: Sugar maple, mountain ash, flowering crab, Norway maple, silver maple, lilac, honeysuckle, peony, phlox, shasta daisy, tomato, beans, lawn grasses, tawny hawkweed, white clover.
Medium: Box elder, American elm, spirea, mockorange, hydrangea, iris sp., onion.
Light: Basswood, white spruce, arborvitae, day lily, plantainlily.

The area was examined again on June 18, 1974 and photographs taken of the previously recorded injury on Norway maple, honeysuckle and peony.

Leaves of geranium, tomato, rose, flowering crab and soft maple with symptoms of sulfur dioxide injury were submitted to the pest control laboratory on September 5, 1974 from Biron, Wisconsin. The area was examined on September 20, 1974 but it was too late in the growing season to effectively asses if the damage was caused by air pollution.

Needle Droop
Needle droop of red pine in plantations was found throughout northwestern Wisconsin. It was also reported from some red pine plantations in Vilas County. Needle droop occurred in late August or early September with the drooping needles remaining green. Needle droop was most severe in low areas within affected plantations. In some plantations up to five years old more than 90% of the trees were affected.

Needle droop is a physiological problem caused by water leaving the current year's needles faster than it can be absorbed by the roots. The cells in the sheath region of the needle collapse and the needle bends downward.

1/ Nicholls, T.H., A.J. Prey and D.D. Skilling, 1974. Rhizosphaera kalkhoffii damages blue spruce Christmas tree plantations. Plant Disease Reporter 58: 1094-1096.

White Pine Needle Blight - Atmospheric Gases

White pine needles are sensitive indicators of the presence of relatively low concentrations of sulfur dioxide and ozone in the atmosphere. Either of these gases causes a characteristic reddish-brown discoloration of the needle tips which is known as tip-burn or white pine needle blight.

White pine needle blight was negligible this year in the northern part of the state. Only one report was recorded and it was from a Christmas tree grower in Waushara County.

Air-pollution-susceptible and resistant white pine scions were collected from three locations in Wisconsin (Table 2) and grafted to white pine root stock at the U.S. Forest Service Oconto River Seed Orchard near Langlade Wisconsin. They will be fumigated with sulfur dioxide and ozone at the University of Wisconsin and outplanted later on the Northern Highland State Forest in Vilas County. Reaction of the grafted trees will be correlated with data provided by an ozone recorder and a wind recorder already operating on the Northern Highland State Forest.

Table 2. Locations of Air-Pollution Susceptible and Resistant White Pine Collection Areas in Wisconsin

County	Location	Legal Description
Green	Albany Wildlife Area	SW¼, SE¼, Sec. 16, T3N, R9E
Richland	River Valley Wildlife Area	SW¼, NW¼, Sec. 2, T9N, R2E
Vilas	Northern Highland State Forest	Gov't Lot #1, Sec. 3, T42N, R5E

STEM AND BRANCH DISEASES

Red Pine Shoot Blight - *Sirococcus strobilinus* Preuss

This disease is characterized by premature dying of lower branches on infected trees and the current year's shoots may be killed. Not all shoots on a tree are attacked in a single year but damage to new growth on red pine reproduction in close proximity to infected pole and sawlog-size trees is especially severe. The fungus, *Sirococcus strobilinus* Preuss was identified in 1972 from Vilas County specimens as the causal agent of the disease by James T. O'Brien, Plant Pathologist, Northeastern Area, State and Private Forestry, Forest Service, U.S.D.A, St. Paul, Minnesota. Shoot blight was verified in Bayfield, Forest and Oneida counties in 1973.

It was reported in Sawyer County (SENE, Section 34, T42N, R8W) in 1974 by George Lehrer, Wisconsin Department of Agriculture. To date, shoot blight has been observed in natural red pine stands in 5 northern Wisconsin counties since 1959 (Figure 11).

Permanent plots were established in Vilas County in 1972 by DNR to determine the impact of the disease on red pine reproduction and planting stock (Appendix B).

The Wisconsin DNR continued to cooperate with the North Central Forest Experiment Station in an ecological study of red pine shoot blight on the Northern Highland State Forest in Vilas County. Spore trapping, phenological data, and weather information were collected from April - October in 1973 and 1974. Results from the Northern Highland State Forest study plot

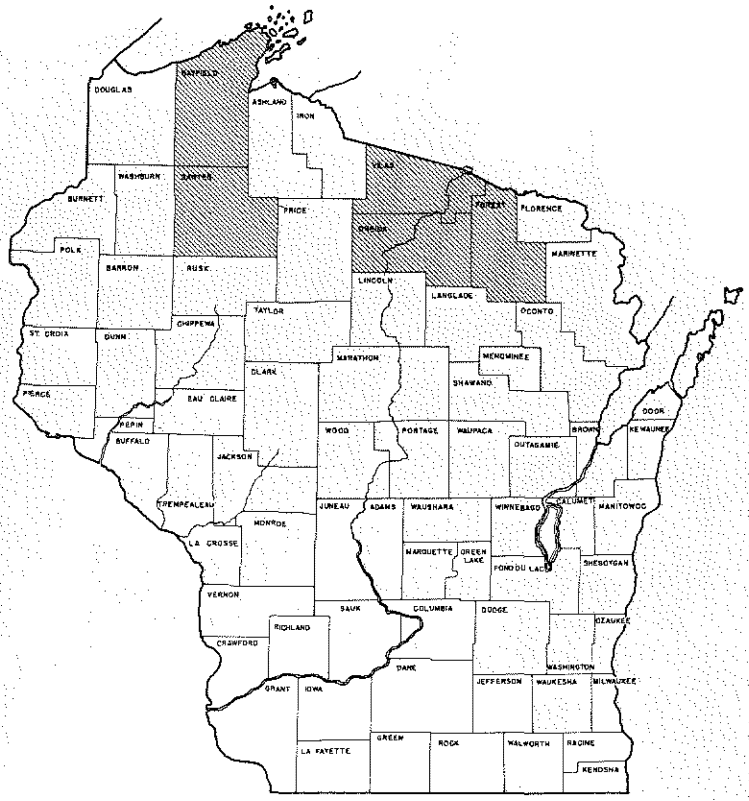


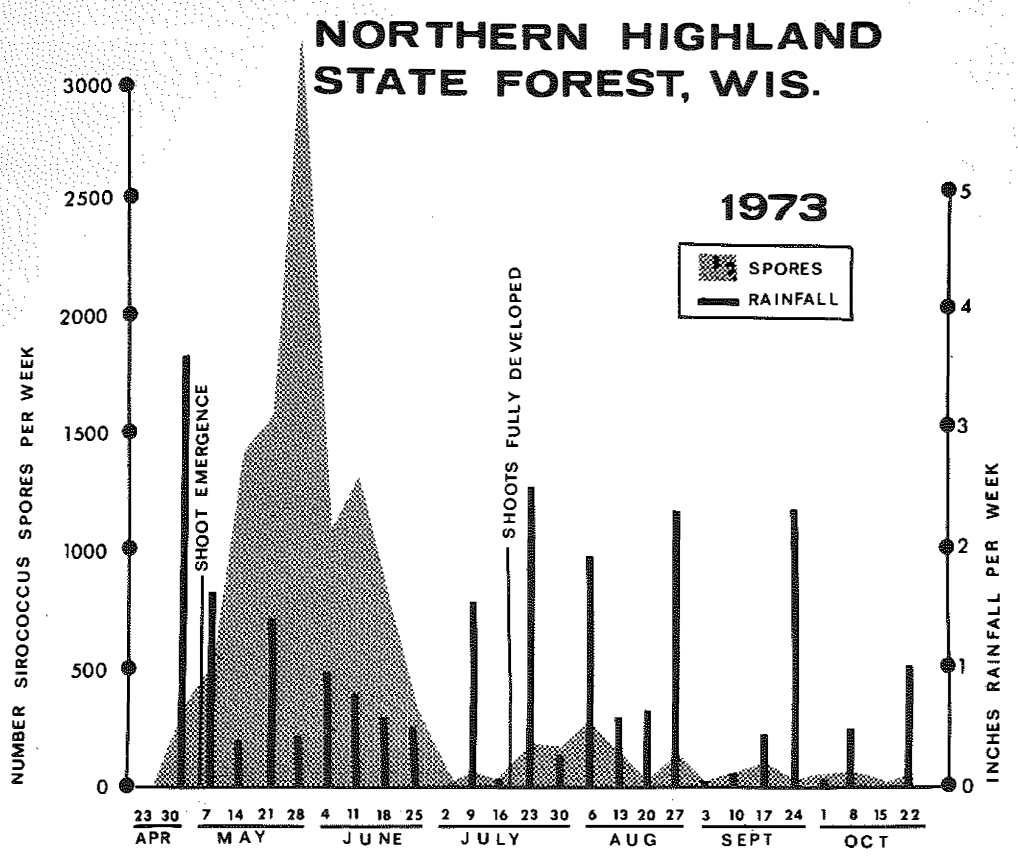
Figure 11. Known County Distribution of Red Pine Shoot Blight - 1974

showed major spore discharge occurred between May 20 and June 4 in both 1973 and 1974 (Figure 12). Major infection of the current-year red pine shoots also occurred at this time on healthy potted red pine seedlings that were placed under infected overstory trees for 2-week intervals throughout the growing season. The trees were then removed to a greenhouse and observed for symptom development.

Similar study areas were also established on the Eagle River District of the Nicolet National Forest and on the Isabella District of the Superior National Forest, in Minnesota, by the North Central Forest Experiment Station. The timing of spore release and infection was similar in all three study areas despite differing geographical locations and climatic factors although rainfall was always necessary before spores could be released from fruiting bodies. This life cycle information will be of direct value in determining proper timing of fungicidal and silvicultural controls for the disease.

Fungicide study plots for shoot blight control were also established on the Northern Highland State Forest by the North Central Forest Experiment Station. These plots were planted with 2-0 red pine during the spring of 1974. Unfortunately, no infection occurred in any of the inoculated plots. Evidently shoot expansion was delayed enough due to planting shock that the seedlings were not susceptible during the period of major spore dispersal. The same phenomenon was observed in 1973.

Scleroderris Canker - *Scleroderris lagerbergii* Gremmen
This disease continues to cause stem cankers and branch mortality in red pine plantations in eastern Vilas County. Branch mortality is confined to the lower whorls in most of the infected plantations. Site appears to be the most important factor in the buildup of the disease and cankering is most prevalent in frost pockets.



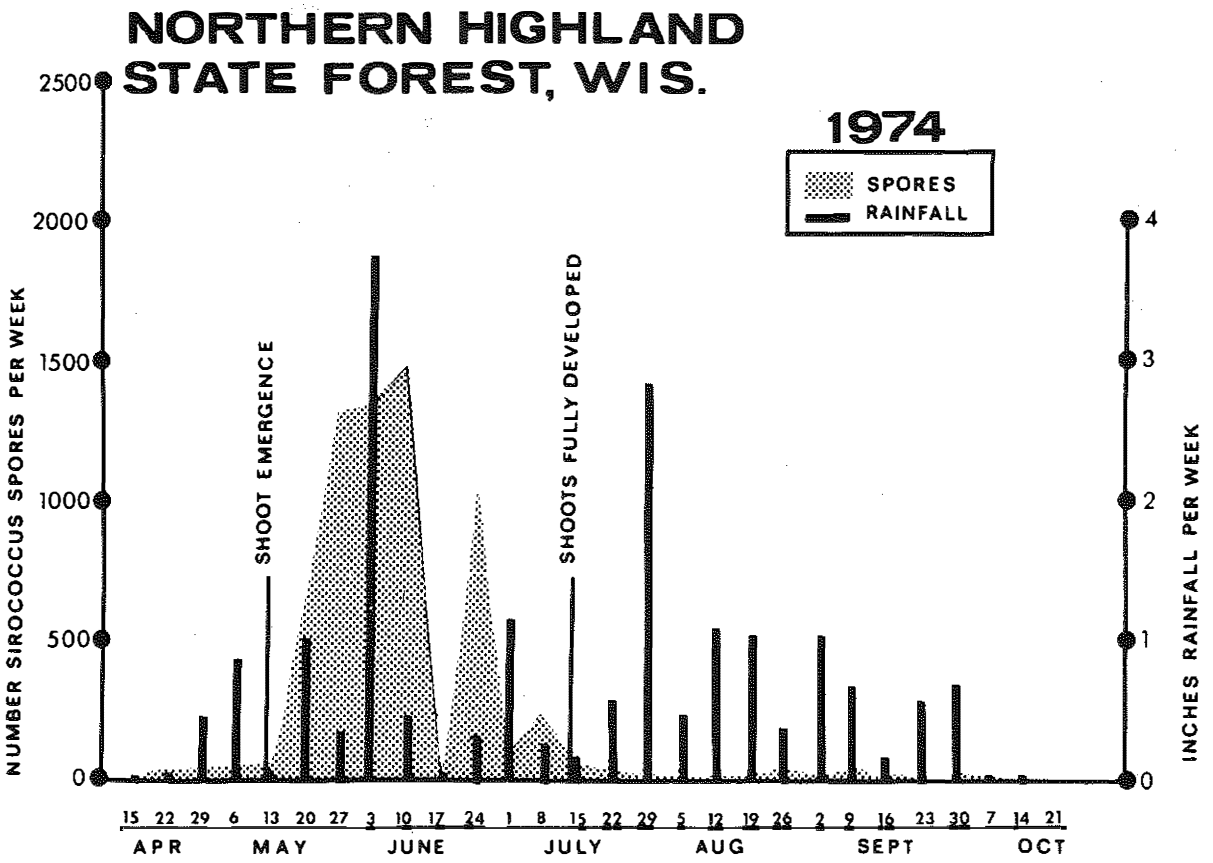


Figure 12. Weekly spore release, rainfall and shoot development red pine shoot blight study area, Northern Highland State Forest, Vilas County, 1973 & 1974. Courtesy of USDA, Forest Service.

MISCELLANEOUS

Ice Damage

About 30,000 acres of jack pine were severely damaged by an ice storm on March 28-29 in Adams, Jackson, Juneau, Monroe, Portage and Wood counties. Most trees were snapped off 10 to 20 feet above the ground (Figure 13). The most concentrated damage occurred in the Town of Saratoga (Wood Co.) and in the towns of Rome and Monroe in Adams County (Figure 15).

The large area of broken jack pine presented a potential threat for a bark beetle population explosion which could result in additional loss of remaining sound trees (Figure 14). About 1/3 of the estimated 100,000 cords of salvageable timber was harvested and the bark beetle threat did not materialize by the year's end.

Jack Pine Mortality - Drought

Jack pine branch and tree mortality occurred in Adams and Wood counties in the summer of 1973. The mortality appeared to be related to adverse environmental conditions. Rainfall was light from June 17 to July 23 with high temperatures in the 80's and 90's. The fungus, *Diplodia pinea*, was observed fruiting in September on twigs that were apparently weakened by winter injury, drought and insects. In some areas many of the rootlets of affected pines were dead from weevil feeding.

Re-examination of the areas infected by *D. pinea*, Adams County in 1973 showed no new infections in 1974. Trees with branch mortality in 1973 have lost their brown needles as did the dead reproduction. There was no bright red-colored foliage indicating any new branch dying or new infection by *D. pinea* during the 1974 re-examination. This area had been heavily damaged by the ice storm in March (Figure 15).

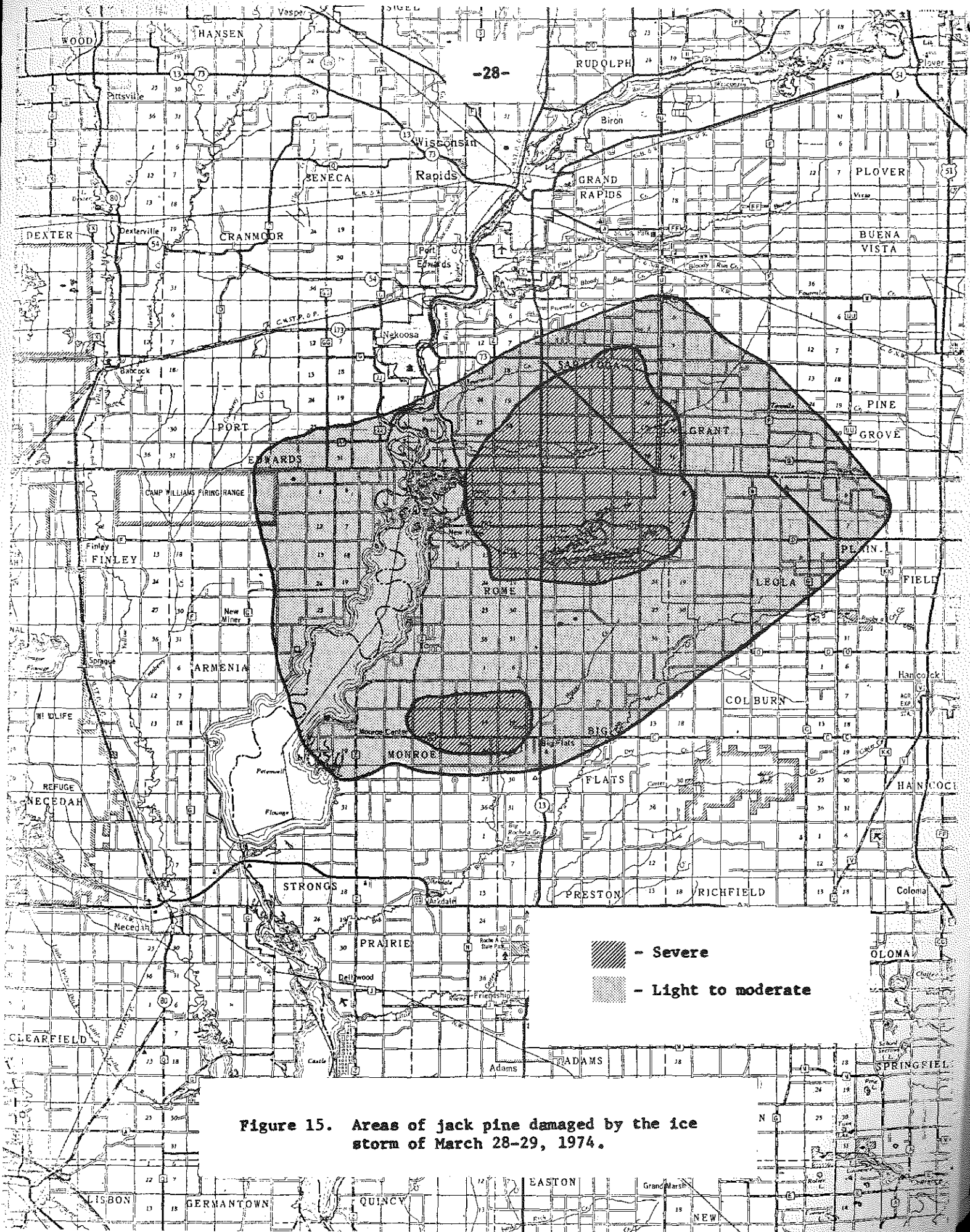


Figure 15. Areas of jack pine damaged by the ice storm of March 28-29, 1974.

Figure 13. Severe ice breakage to pole-size jack pine in Adams County, following a storm which occurred on March 28-29, 1974.

Figure 14. Stan Banash (left) Department of Natural Resources forest Paper Company District Forester, examine ice-damaged jack pine for evidence of bark beetles.

APPENDIX A
Biological Control Program

by
David J. Hall[1/]

OBJECTIVES

Objectives are to survey the parasites attacking forest insects in Wisconsin, and to establish gypsy moth parasites on alternate hosts documenting ecological conditions of establishment.

PARASITE RELEASES

In 1973 two species of gypsy moth parasites were released in Wisconsin. *Brachymeria intermedia* (Nees) was released near Black River Falls in Jackson County, near the Brule fire tower in Bayfield County, and near Pelican Lake in Oneida County. *Meteorus pulchricornis* (Wesmael) was also released near Black River Falls. *Brachymeria intermedia* was released in June 1974 at four sites (500 per site) in Menominee County; the intended alternate host was *Croesia samipurpurana* (kft.).

METHODS

Near each of the 1973 release sites plus a proposed release site on the Northern Unit, Kettle Moraine State Forest, two or three permanent plots were established in July and August, 1974 representing the most common local plant community types. Every flowering plant species in each of the plots was searched once per week during the field season. Immature insects were collected and placed in clear plastic 1 oz. creamer cups. The plant hosts were identified and noted on the lids of the cups. The materials were collected and shipped weekly by U.S. mail to the lab in Madison.

The insects from each plot are sorted by plant host species and those from each plant species assigned a field collection number. Those in each collection number are then sorted to species. Any specimen not immediately identifiable is preserved and placed in a reference collection. The data (date, locality, plant host, insect species, stage, and number of specimens) are recorded on a 4"x 6" form.

The cups containing the insects are held on polystyrene sheets with the aid of carpet tape. This system allows quick retrieval and replacement of the cups and permits rapid inspection for emerged adults, dead insects, and insects in need of food.

The insects are fed daily on foliage collected near the lab. They are held at room temperature until adults or parasites emerge or until early November. Then cups containing living insects are placed in cold storage for 2 months for Lepidoptera and 4 months for sawflies. Adults are killed by freezing and delivered to Dr. Roy D. Shenefelt, Department of Entomology, University of Wisconsin-Madison, for identification.

1/ Forest Entomologist, Dept. of Natural Resources, Madison, WI.

The lab identification of living larvae is critical. Often, a single specimen of a species is collected. If it is not identified to species and a parasite emerges from it, the parasite-host relationship remains unknown. As the reference collection is built up and as experience is gained, identification will improve. In the meantime, there will be deficiencies in identification of immatures.

RESULTS

From July 1 to October 2 about 2,500 immature insects were brought into the lab. Many adult Lepidoptera and parasites were reared and delivered to Dr. Shenefelt. As the insects are named, a list of species will become a part of subsequent annual reports.

APPENDIX B
Red Pine Shoot Blight Damage Survey
by
Ray Weber & Stanley Banash 1/

Plots were established in 1972 to document the impact of this problem on young red pine. Plots were located at two sites in Vilas County. Both areas have pole and/or sawlog trees where lower crowns apparently have been affected by shoot blight for several years. Infection of planted reproduction in these areas appears to have begun in 1971. Data from these plots is summarized as follows:

Plot 1. Northern Highland State Forest - Sec. 24, T41N, R17E.

Plantation was established about 1956 in the understory and variable openings of a pole size red pine stand. Average tree height in the openings is 20 feet and suppressed or understory trees 8 feet. Plot size is approximately .1 acre (1/5 chain x 5 chains) extending through various size openings and understories. Distribution of mortality is summarized in Table 1.

Table 1. Red pine shoot blight incidence, 1974, Starrett Lake Plot (Sec. 24, T41N, R7E

Tree Location	Trees (No.)	Average Height (Ft.)	Trees Dead (No.)	Shoots Killed (%)
Opening a/	43	20	0	20
Understory b/	57	8	23	90

a/ Growing in openings 35 to 300 feet wide
b/ Under or adjacent to pole and small sawlog-size trees

Most of the suppressed non-crop trees will probably die due to a combination of shading and shoot blight infection. Trees growing well in the openings, by contrast, produce many more new shoots than the numbers being affected by shoot blight.

Plot 2. Private Plantation (Uihlein) - Sec. 24, T42N, R9E, Vilas County.

Plantation established about 1959 in an open field adjacent to a large affected sawlog tree at one edge. Average tree height is 14 feet. Shoot blight infection data was recorded in 1972 on tagged trees along lines extending south, west and east approximately 300 feet from the affected tree. By 1973, so many current shoots in the upper crowns had also become affected by *Scleroderris* canker and/or spittlebug feeding that it became very difficult to distinguish new shoot blight infections from other damage. Consequently, no significant data was obtained in 1973 and 1974. However, it is apparent that the 1973-74 shoot blight infection was very light and confined largely to within 50 feet of the affected sawlog tree. No mortality due to shoot blight has occurred in this open-grown plantation and none is expected.

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